

# MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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## INTRODUCTION.

The REVIEW for June, 1896, is based on 2,690 reports from stations occupied by regular and voluntary observers, classified as follows: 149 from Weather Bureau stations; 33 from U. S. Army post surgeons; 2,363 from voluntary observers; 34 from Canadian stations; 1 from Hawaii; 96 received through the Southern Pacific Railway Company; 14 from U. S. Life-Saving stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

The WEATHER REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the statistical tables are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data. Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada, Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu, and of Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico.

## CLIMATOLOGY OF THE MONTH.

### GENERAL CHARACTERISTICS.

The month was not distinguished by any remarkable storm. The mean pressure was quite uniformly distributed, but the low pressure that stretches northward from the Gulf of California was unusually well marked. The temperature was slightly above the average in the Lake Region and decidedly so in the Plateau Region; a few stations in Texas and adjoining States reported the highest mean pressure on record; the maximum temperatures in these regions were also the highest on record and the maximum for San Diego was 15° above the previous record. The rainfall was large in Florida and along the east Gulf Coast being the largest on record at Tampa and Meridian.

### ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The *mean pressures* during the current month were highest on the immediate coast of Washington and Oregon and were also rather high on the south Atlantic Coast.

The highest were: Fort Canby, 30.11; Tatoosh Island and Eureka, 30.09; Port Angeles and Portland, Oreg., 30.07; Seattle, 30.06; Charleston and Jupiter, 30.05; Savannah, Jacksonville, Key West, and Tampa, 30.04. The mean for Bermuda was 30.16. The mean pressures were lowest in Arizona and low in the Gulf of St. Lawrence, Alberta, and Assiniboia. The lowest were: Yuma, 29.72; Phoenix, 29.76, Grindstone, 29.82, El Paso and Medicine Hat, 29.83; Calgary, Miles City, and Fresno, 29.84; Havre, 29.85.

As compared with the normal for June, the mean pressure was in excess over the north Pacific Slope, the Missouri and Mississippi valleys, and Lake Region. It was slightly deficient in the remaining regions. The greatest excesses were: Fort Canby, 0.11; Denver, 0.10; Tatoosh Island and Lander, 0.09; Pueblo and Port Angeles, 0.08; Wichita, 0.07. The greatest deficits were: St. Johns, N. F., 0.07; Yuma, 0.06; Fresno and Los Angeles, 0.04.

As compared with the preceding month of May, the pressures, reduced to sea level, show a rise over the upper Lake Region, the Mississippi and Missouri valleys and the north Pacific Slope, but a fall over the central and southern Plateau Region, California and the Atlantic States. The greatest rises were: Pierre and Huron, 0.12; Moorhead, St. Paul, Concordia, and Wichita, 0.11; Omaha, Kansas City, and North Platte, 0.10. The greatest falls were: St. Johns, N. F., Sydney, Charlotte-town, Sacramento, and Fresno, 0.13; Chatham and Redbluff, 0.12; Halifax, 0.11.

### AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month of June eight storms or depression systems have been sufficiently marked to be traced and charted on Chart I. There have also been seven high areas traced on Chart II. In tracing these highs and lows it has been found extremely difficult at times to distinguish definite highs and lows with an apparent motion in any well defined or certain direction. Often one low will be absorbed by another following in the rear, or else it will fade away entirely. Often the only way in which such a system can be placed upon the map is by a study of the wind directions, since the bendings of the isobars inclose a very large region with no definite high or low. Some of the more important facts regarding the origin and apparent paths and motions of these highs and lows are given in the accompanying table. In presenting

this table it should be borne in mind that the figures showing apparent paths and velocities are quite uncertain at times, owing to the impossibility of locating any clear track. These velocities must be taken with a great deal of allowance, and must not have ascribed to them any extreme accuracy. Till we know more of the constitution and mechanism and cause of motion of these conditions in the upper air we must continue to grope in the dark and study apparent results as indicated by our weather maps. Indeed it is by no means unimaginable that we are dealing with several systems actually existing one above the other, and yet projected in a single system or bendings of isobars upon our weather maps.

The observations of wind velocity on Mount Washington during the passage of highs have shown that when the wind is of moderate velocity or steadily diminishes on the approach of a high, there will invariably be a very marked rise in pressure, often a greater rise than at the base. On the other hand, if the wind maintains its velocity as the high advances, the rise in pressure is slight, or almost unnoticeable. Here we have a slight indication of the constitution of the so-called high.

*Movements of centers of areas of high and low pressure.*

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
<b>High areas.</b>										
I.	1, a. m.	44	90	8, a. m.	48	64	3,630	7.0	519	21.6
II.	5, p. m.	51	98	7, p. m.	49	82	830	2.0	415	17.3
III.	5, p. m.	42	126	11, a. m.	41	86	2,680	5.5	487	20.3
IV.	8, a. m.	41	126	22, a. m.	38	80	6,460	14.0	463	19.4
V.	30, a. m.	44	123	26, a. m.	43	64	4,310	6.0	719	30.0
VI.	21, p. m.	42	118	27, p. m.	36	73	3,390	6.0	565	23.5
VII.	26, p. m.	52	116	30, p. m.	38	73	3,170	4.0	794	33.1
Sums.....							24,470	44.5	3,965	165.2
Mean of 7 paths.....									566	23.6
Mean of 44.5 days.....									550	22.9
<b>Low areas.</b>										
I.	1, a. m.	51	111	5, p. m.	46	87	2,330	4.5	518	21.6
II.	4, p. m.	52	116	13, a. m.	49	53	4,610	8.5	543	22.6
III.	9, p. m.	37	109	14, p. m.	39	70	3,840	5.0	769	32.0
IV.	12, a. m.	53	116	13, p. m.	51	99	3,770	1.5	513	21.5
V.	13, p. m.	52	113	16, p. m.	39	100	1,590	3.0	530	22.1
VI.	18, p. m.	53	112	22, p. m.	47	59	2,750	4.0	688	28.7
VII.	21, p. m.	51	116	26, p. m.	51	67	2,500	5.0	500	20.8
VIII.	26, p. m.	52	101	30, a. m.	50	63	1,960	8.5	559	23.3
Sums.....							20,350	35.0	4,620	.....
Mean of 8 paths.....									578	24.1
Mean of 35 days.....									581	24.2

A short description is here given of each high and low noted during June.

**HIGH AREAS.**

I.—Unlike the lows, four of the highs took their origin from the north Pacific Coast. It is probable that the permanent high pressure in the south Pacific had moved to the north, and these highs were split off from that. No. I was first noted a. m. of 1st in Wisconsin; its path was to the east for seven days, and it was last seen in the Gulf of St. Lawrence 8th, a. m.

II.—First noted in Manitoba p. m. of 5th; its motion was east for two days, and was last noted to the north of Lake Superior p. m. of 7th.

III.—First seen off the middle Pacific Coast 5th, p. m.; its motion was at first east, then east-southeast, and was last seen in Indiana a. m. of 11th.

IV.—First noted off the middle Pacific Coast 8th, a. m.; its motion was southeast to Texas, where it turned 13th, p. m., to northeast, and then southeast, disappearing off the south Atlantic Coast 22d, a. m.

V.—Was first noted in north Oregon 20th, a. m.; its motion was nearly eastward for six days, and was last seen off the Nova Scotia coast 26th, a. m.

VI.—First noted off the north Pacific Coast 21st, p. m.; its motion was a little south of east, and it was last seen off the middle Atlantic Coast 27th, p. m.

VII.—Was first noted to the north of Montana 26th, p. m.; its course followed high No. VI, and disappeared off the middle Atlantic p. m. of 30th.

**LOW AREAS.**

I.—With a single exception, No. III; all the lows of this month have taken their origin in the region to the north of Montana; it is probable that there was a rather permanent area of low pressure in this region, and each depression system was split off from this permanent low or locus of low pressure; No. I started 1st a. m., moved eastward, and was last noted in upper Michigan 5th, p. m.

II.—First noted, 4th, p. m.; its motion was eastward for 8.5 days, and was last noted over Newfoundland a. m. of 13th.

III.—First noted in Colorado, p. m. of 9th; its path was at first north than east, and it finally disappeared off the middle Atlantic Coast p. m. of 14th.

IV.—First noted a. m. of 12th, and moved for only one and a half days eastward; it was seen last in Manitoba p. m. of 13th.

V.—First noted p. m. of 13th; its motion was south-south-east for three days, and it was last seen in Kansas 16th, p. m.

VI.—First noted p. m. of 18th; its motion was east for four days, and it was last seen off Nova Scotia 22d, p. m.

VII.—First seen p. m. of 21st; its motion was eastward, almost in the path of No. VI for five days; it was last seen at the mouth of the St. Lawrence 26th, p. m.

VIII.—First seen 26th, p. m.; it moved for 3.5 days eastward, and was last noted at the mouth of the St. Lawrence a. m. of the 30th; nearly the whole path of the last three storms was to the north of the stations of observation.

**LOCAL STORMS.**

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

There were a large number of severe thunderstorms, often accompanied by hail, during the month. The dates on which no severe thunderstorms were reported were: 1st, 2d, 10th, 11th, 12th, 19th, 26th, 28th, 29th, 30th.

No severe tornadoes occurred during the month, but minor tornadoes were reported in South Dakota on the 6th; near Oshkosh, Wis., on the 8th; at Wyeth, Ala., on the 9th; at Nutley, N. J., on the 21st, near Clayton, Wis., on the 24th, and at West Louisville, Ky., on the 27th. The record by dates is as follows:

3d.—Severe thunderstorms in the vicinity of Cincinnati, Ohio. Telegraph and telephone lines fences, and outbuildings damaged.

4th.—Severe hailstorms near Pender and Lincoln, Nebr.; heavy rains, accompanied by wind and hail, in central Kansas and in portions of Iowa, Indiana, Ohio, and Kentucky.

5th.—Heavy rain and hail storms, with high winds, in North Loup Valley, Nebr. The valley was flooded for miles; bridges, fences, and railroad tracks were washed away. Heavy rains also fell in the vicinity of Deadwood and Rapid City, S. Dak.; in Minnesota, Wisconsin, Iowa, the Missouri Valley, and in Ohio. The damages were generally confined to growing crops, bridges, and fences.

6th.—Severe windstorms were reported near Brazil, Ind., and in Daviess County, Mo. At Lynch, Nebr., a heavy wind blew down several buildings; loss, \$1,000. A minor tornado passed through the town of Wentworth, Lake County, S. Dak.; the damage was light—not over \$500. Virgil and Cavour, Beadle County, were visited by severe local storms, having some of the characteristics of tornadoes; the money value of property destroyed was about \$1,500.